



TITLE:

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CITATION:

Nakazima, Sei. A Comparative Study of the Speech Development of Japanese and American Children (Part Five) : Preparation for the Syntacticization Process. 音声科学研究 1973, 7: 1-16

ISSUE DATE:

1973

URL:

<http://hdl.handle.net/2433/52593>

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A Comparative Study of the Speech Development of Japanese and American Children (Part Five)*

—Preparation for the Syntacticization Process—

Sei NAKAZIMA

SUMMARY

We recorded the speech sounds of nine Japanese and three American infants in Japan and two American infants in the U.S.A., all of whom were between the ages of seven to twenty-two months. We then compared the developmental process of speech sounds until the beginning of the syntacticization process of the three groups.

At about twelve months of age the infant begins to use a few words. During the first several months of the second year, he utters, in all sorts of situations, sounds of the words and meaningless sounds with various articulatory forms. Then he begins to utter two- or three-words-sentence-like sounds, i.e. sound chains consisting of two or three sound clusters, mostly including sounds of the words. He utters some of the words as if they were the cores of sound chains.

From about the middle of the second year words and phonemes uttered by the infant increase in number. Most of the words he utters are those which grammatically could be classified as nouns. But there are in addition those which could be classified as pronouns, adjectives and adverbs. At first, of course, for him these words are not differentiated in grammatical function. Through the first several months of the phonemicization and symbolization process, he begins to notice some kind of dissimilarity between them and to use them differently. Then he begins to put two of them together and constructs two-words-sentences.

We do not find significant differences among the three groups, except that the group of American infants in Japan shows slow developmental process just as other bilinguals do.

I. INTRODUCTION

In the former articles (Nakazima, S., 1970, 1972), we described as follows: At about twelve months of age, the infant begins to use words. During the first several months of the second year, he utters, in all sorts of situations, not only word sounds but also meaningless sounds with various articulatory forms. Through these efforts of expression in sounds he begins to notice some kind of symbolic

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* This research project has been supported by a grant from the Japanese Ministry of Education.

relationship between words and the world and he acquires some kind of learning set to use words in reference to what he wants to express. Then at about the middle of the second year he begins to develop his phonemicization and symbolization process, i.e. phonemes and words uttered by him increase in number. But even at the end of the second year phonemes are not articulated differentially and words are not always used correctly. By the end of the second year he begins to utter a few two- or three-words-sentences.

In this article we would like to clarify the developmental process of the infant's speech sounds until the beginning of the syntacticization process, that is during the first two thirds of the second year. We describe how the infant's sounds begin to be organized into a syntactic structure of language; what kind of relationship exists between the syntacticization and the phonemicization, symbolization processes; what kind of relationship exists between the syntacticization and the developmental processes of other bodily, mental functions, and what kind of factors have influence upon them.

II. PROCEDURES

There were fourteen subjects, nine of whom were Japanese and five were Americans. As shown in Table 1, there were four female and five male Japanese, and one female and two male Americans who were living in Kyoto, and one female and one male American who were living in the U.S.A. We recorded on tape the speech sounds of each subject and those of his parents in the home and described the situations in which the child spoke and behaved. Each recording took about half an hour. We used two kinds of tape recorder: TEAC

Table 1. Subjects and Recording Conditions.

Nationality	Place where S's voices were recorded	Subjects (Sex)	Beginning of recording by tape recorder	One recording per
Japanese	Kyoto, Japan	E.T. (f)	28 days (0 : 0, 28)	1 wk.
		Ya.N. (f)	1 mo. (0 : 1)	2 wks.
		Y.S. (f)	2 mos. (0 : 2)	2 wks.
		N.O. (f)	6 mos. (0 : 6)	2 wks.
		H.K. (m)	1 mo. (0 : 1)	2 wks.
		T.Y. (m)	1 mo. (0 : 1)	2 wks.
		T.T. (m)	7 mos. (0 : 7)	2 wks.
		T.U. (m)	12 mos. (1 : 0)	2 wks.
		Yu.N. (m)	13 mos. (1 : 1)	2 wks.
American	Kyoto, Japan	F.P. (f)	6 mos. (0 : 6)	2 wks.
		C.W. (m)	6 mos. (0 : 6)	2 wks.
		E.D. (m)	7 mos. (0 : 7)	2 wks.
American	Campaign, Illinois U.S.A.	M.O. (f)	16 mos. (1 : 4)	2 wks.
		C.C. (m)	6 mos. (0 : 6)	2 wks.

(TD 102, AR 11) for the subjects in Japan, and SONY EM-1 for the subjects in the U.S.A. The overall recording and reproducing characteristic of the former was from 40 Hz to 15000 Hz ± 3 dB, that of the latter from 100 Hz to 7000 Hz ± 5 dB, speed 7 1/2 inch/second. We analysed these speech sounds on a soundspectrograph.

III. RESULTS AND DISCUSSION

In order to save space we present two cases in Table 2, 3 and Fig. 1, 2.

Our hypothesis is that the preparation period for the syntacticization process is during the first two thirds of the second year and the two points described below are the characteristic features of this period.

1. After the infant begins to use a few words, he utters, in all sorts of situations, sounds of the words and meaningless sounds with various articulatory forms. And a few months later he begins to utter two- or three-words-sentence-like sounds mostly including sounds of the words.

We found in our study that the infants began to use a few words at about twelve months of age. The age in month, when they began to use words, were different from infant to infant and the age distribution was from ten to thirteen months. After they began to use words, for several months they uttered, in all situations, sounds of words and meaningless sounds with various articulatory forms (Nakazima, 1966, 1970, 1972).

At first, most of the sounds, both meaningful and meaningless, were uttered separately, i.e. not in a chain with other sound clusters, and in one word length, i.e. the number of syllables of the sounds was small.

The infants sometimes uttered several sound clusters in succession and also sounds with more than several syllables, e.g. a Japanese female of ten months, when she was called by her mother, uttered a meaningless sound chain [a:ɪjə ə:de a:ɪjə a:ɪjə] (Nakazima, 1972) and another Japanese female, fourteen months old, when she found a dog's picture, uttered [wawouwwouwwouwwow] (one of variations of [wanwan] (bowwow)) (Nakazima, 1970). These sounds were repetitions of some similar articulatory forms. Therefore, these sounds seem to be utterances which show a developing process from repetitive balbbings to multi-words-sentences.

A few months after the infants began to use words, they uttered in a conversational way two- or three-words-sentence-like sounds, i.e. sound chains consisting of two or three sound clusters mostly including sounds of the words, or sentence-long meaningless sound clusters. For example, an American male, who began to use the word "Bowwow" at eleven months, uttered [ba: hawauwə]-like sounds at fourteen months and [ə hāũjā ba: ɟɪə]-like sounds at fifteen months when he found a dog's picture in his book. [hawauwə]-like sounds and [hāũjā]-like ones were variations of "Bowwow" sounds. A Japanese male, who began to use the

word [wanwan] (bowwow) at eleven months, uttered [doŋkietɕə kofje]-like sounds when he was trying to imitate his father's [kofe] (this) and uttered [o:ɣoxidetɕa:]-like sounds to his parents when he was talking to them at thirteen months. [kofje]-like sounds were one of variations of [kofe] (this) sounds. [doŋkietɕə]-like sounds and [o:ɣoxidetɕa:]-like ones were meaningless sounds. He uttered these long sound clusters in a conversational way, as if he was talking eagerly to his parents (Refer to Table 2, 3 and Fig. 1, 2).

We think that through their effort to express sounds of words and meaningless sounds for a few months the infants began to show some kind of segmentations in their utterances and to utter a few words as cores of the segmentations.

Some of the words which the infants uttered as cores of the segmentations were the same as the words which they had begun to use and uttered frequently in their effort to express sounds and some of the words were different from these, e.g. the Japanese male began to use the word [wanwan] (bowwow) and he uttered [kofe] (this) sounds as cores.

A few months after the segmentations in the infants' utterances, i.e. at about the middle of the second year, they began their phonemicization and symbolization process, i.e. words and phonemes uttered by them increased in number.

2. After the beginning of the infant's phonemicization and symbolization process most of the words uttered by him can be classified grammatically as nouns. He also utters some words which can be classified as pronouns, adjectives and adverbs. At first for him these words are not differentiated in grammatical function. Through the first several months of his phonemicization and symbolization process, he begins to notice some kind of dissimilarity between them and to use them differently. Then he begins to put two of them together and constructs two-words-sentences.

In our study of the American male we found that his words and phonemes increased in number from sixteen months. Therefore we think that his phonemicization and symbolization process began at sixteen months. At the same age in months when he found a picture of a lion family in his book he said [wauwa] (bowwow) and another day he looked at a picture of a lion on the ground and said [a: njamjaɪ] (night-night, meaning "Lying down" or "Sleeping"). Grammatically as he used them the word "Bowwow" could be classified as a noun and the word "Night-night" as an adjective. But we do not think that at this age level the child used the two words differentiatedly in a grammatical sense.

When he was twenty-one months old he began to use the word "Here" in two-words-sentences, e.g. he said [ɕja wauwa] (meaning "Here is a bowwow.") looking at a lion's picture. At the same age in months he began to use the Japanese word [bu:ɾ]. The word [bu:ɾ] is a Japanese baby word and means "Car". A Japanese infant uses it usually to express the names of vehicles and sometimes to express their movement. The American male began to use the word "Car" at sixteen

months. Since then he had been using it as the name for vehicles. When he was playing with his toy car he said [bʊ:] to express its movement. He used the two words "Car" and [bʊ:] for different purposes. When he was seventeen months old he began to use the word "Horsey", uttering [çi:] or [çi:] etc. He used the word as the name for horses. At twenty-one months he began to use the Japanese baby word [pakapaka], meaning "Horsey" or "Gallop". He responded to his mother's saying "Horsey" by uttering [pa pakapa]. At twenty-two months pointing at a picture of galloping horses he said [çi: çija pokopoko] (meaning "Horses here are galloping.").

We think that through the first several months of his phonemicization and symbolization process he began to notice some kind of dissimilarity among words and to use them differently. And he began to put some of them together and constructed two- or three-words-sentences.

When the American male was twenty-one months old his mother took his father's brush and asked him "What's this?" He answered [p'apa:]. He was supposed to say "Papa's". He did not use the word "Brush" at this age. He was not yet able to change the form of the word "Papa" to the possessive case.

As shown in Table 2, 3 and Fig. 1, 2, the Japanese and the American males showed the same developing process. But the Japanese showed a somewhat faster developing process and used words which could be classified as nouns and as pronouns etc.

After the beginning of their phonemicization and symbolization process not all the infants began to use words which could be classified as adjectives or adverbs or pronouns. At fourteen months an American female began to use the word "There" and she began her phonemicization and symbolization process at eighteen months (Nakazima, 1972).

To construct two-words-sentences some of the infants used the same words as those which they used as cores of sound cluster chains before their phonemicization and symbolization process and some of them used different words. The Japanese male was one of the examples of the former and the American male was one of the examples of the latter.

In the former article (Nakazima, 1972), we stated that parents' loving care combined with vocalization, as O.H. Mowrer mentioned (Mowrer, O.H., 1950), and infant's cognitive development based on his rich experiences, as J. Piaget suggested (Piaget, J., 1953, 1962), were important for the development of his phonemicization and symbolization. Both of these processes were also important for the preparation for infants' syntacticization process. Parents' loving care was one of the basic factors which made them comfortable. When they were uncomfortable they did not speak much. Rich talks and rich experiences with their parents and other family members stimulated segmentation in their utterances and differentiation in their use of words.

We would like to add one point. Though the American male began his phonemicization and symbolization process at sixteen months, from eighteen through twenty months words and phonemes he uttered did not increase much. During these few months he spent much time in moving his body, e.g. walking or running around, playing with toys etc., and he was not as fond of looking at books and of uttering words as he had been before. As Professor H. Oka mentions (Oka, H., 1970), the infant's speech development did not proceed parallel with his body movement development. But we think the rich experience with his body during these months was underlying cause for the increase in the number of words and phonemes he used and for his syntacticization process from the time he was twenty-one months.

I would like to express my grateful acknowledgements to Dr. and Mrs. R. Confer, Dr. and Mrs. E. Daub, Prof. and Mrs. S. Kuraishi, Prof. and Mrs. N. Okamoto, Dr. and Mrs. J.P. O'Neill, Mr. and Mrs. H. Prins, Prof. and Mrs. S. Shimizu, Mr. and Mrs. Toyohara, Prof. and Mrs. T. Tsushima, Dr. and Mrs. N. Yanagihara, Mr. and Mrs. Uno, Dr. and Mrs. Wood, and my wife for their kind cooperation.

REFERENCES

1. Mowrer, O.H. 1950. *Learning Theory and Personality Dynamics*. The Ronald Press.
2. Nakazima, S. 1966. A comparative study of the speech developments of Japanese and American English in childhood (2) —The acquisition of speech—. *Studia Phonologica*, IV, 38-55.
3. Nakazima, S. 1970. A comparative study of the speech developments of Japanese and American English in childhood (Part Three) —The re-organization process of babbling articulation mechanisms—. *Studia Phonologica*, V, 20-35.
4. Nakazima, S. 1972. A comparative study of the speech developments of Japanese and American children (Part Four) —The beginning of the phonemicization process—. *Studia Phonologica*, VI, 1-37.
5. Oka, H. 1970. Development during infancy (in Japanese). In A. Yoda & H. Azuma (Eds.), *Child Psychology*. Shin-yosha, Pp. 30-62.
6. Piaget, J. 1953. *The Origin of Intelligence in the Child*. (translated by M. Cook) Routledge & Kegan Paul.
7. Piaget, J. 1962. *Play, Dreams and Imitation in Childhood*. (translated by C. Gattegno & F.M. Hodgson) Routledge & Kegan Paul.

(Aug. 31, 1973, received)

Table 2. Preparation for the Syntacticization in the Case of E.D., a male American in Japan.

S : subject M : mother F : father N : Nakazima

Age	Speech Development	Speech Sounds* ¹ []	Words, S began to utter	
			spontaneously	in imitation
Year Month				
0 : 7	<i>Development of phonatory-articulatory-auditory mechanisms during the period of babbling</i>			
0 : 8	S babbled repetitively.			
0 : 9	<i>Reorganization of babbling phonatory-articulatory-auditory mechanisms and their application to language</i>			
	S began to respond to his parents with simple sounds.			
	S began to imitate his parents' speech sounds.			
0 : 10	S began to be able to understand his parents' speech sounds.			
0 : 11	S began to call to his family members with simple sounds.		bowwow	bowwow
	S looked at a dog, cared by his family members, and uttered	[auwə]* ²		
1 : 1	For these several months, S uttered, in all sorts of situations, bowwow-, papa-sounds and meaningless sounds with various articulatory forms, and sometimes he uttered two- or three-words-sentence-like sounds mostly including bowwow- or papa-sounds.			papa [mamma]* ³ (food)
1 : 2	S found a horse's picture in his book and uttered	[ba: hawauwə]* ²	papa	mama
1 : 3	F called S's name and S responded to it	[bə ba: a: dʒə]		
	F called to S and S responded to it	[a gju:njauwə]* ⁴		
	S found a dog's picture and uttered	[ə hãũjã]* ² ba: ʃɪə* ⁵		
	When S was looking at pictures of various kinds of animal he uttered	[hawwə]* ² wauwə* ²	ʔa? ʔa: ʃe]	
1 : 4	<i>Development of phonemicization and symbolization of speech sounds</i>		[mamma]* ³ (food)	
	When S was looking at pictures in his book he uttered	[əmpəwə buмба pɹə]* ⁶	mama night-night (lying down or sleeping)	night-night (sleeping)
			shoe	shoe

*1 These speech sounds are not the same as those described by the phonetic alphabets but only roughly similar to them. Refer to their soundspectrograms in Fig. 1.

*2 One of variations of bowwow-sounds.

*3 One of Japanese words.

*4 One of mixtures of bowwow-sounds and meaningless sounds.

*5 We are not sure whether it is "Here" or not.

*6 These are mixtures of bowwow- and papa-sounds and meaningless sounds.

	S found a picture of a lion on the ground and uttered	[a: njamja* ⁷]	car miaow book no	car miaow book see duck quack horsey milk bye-bye choo-choo (train)
1 : 5	S spoke more frequently when he was looking at books than when playing with toys.		bye-bye horsey choo-choo	mammy daddy kitty
1 : 6	S walked and ran more freely than before. From eighteen through twelve months of age S spent much time in moving his body, e.g. playing, running etc., and he was not so fond of looking at books and of uttering words as before.		quack see [ija]* ³ (no)	birdy
1 : 8	N asked S "What's this?" pointing at a picture of a train and S answered	[ʔa tɕɪ: tɕɪ: * ⁸] ^{*9}	birdy spoon	
1 : 9	<i>Development of syntacticization of words</i> S again uttered many words and he began to construct a sentence. M said "Horsey" and S responded		chair bread bottle telephone	chair bread bottle telephone
	M asked S "What's that?" pointing at a lion's picture and S answered	[pə pakapa* ¹⁰] ^{*11}	downstairs cake here	downstaires cake ball
	S looked at a toy car and said	[ɕɪja* ¹² wauwa* ²] ^{*13}	[pakapaka]* ³ (galloping)	moocow
	S pointed at a man's picture and said	[ɕɪa* ¹² k'a:]	[bu:]* ³ * ¹⁴ (sound of car horn)	bunny cookie
	S found a girl's picture in his book and said	[ɕɪa* ¹² ɕɪja* ¹² p'apa]		hair
	M took F's brush in her hand and asked S "What's this?" S answered	[ɕɪjə* ¹² mama] [p'apa:]* ¹⁵		

*7 One of variations of night-night-sounds.

*8 One of variations of choo-choo-sounds.

*9 It seems to be one of variations which show a developmental process towards two-words-sentences.

*10 One of variations of [pakapaka]-sounds (galloping).

*11 M and S seemed to construct a sentence "A horsey is galloping."

*12 One of variations of here-sounds.

*13 The first two-words-sentence, meaning "Here is a bowwow."

*14 [bu:] is one of Japanese baby-words. It means "Car". S uttered car-sounds as the name of some kinds of vehicles and uttered [bu:] to express movement of a toy car when S was playing with it.

*15 It means "Papa's brush".

1 : 10	M was holding S's toy car in her hand and asked	mammy	
	S "Where's your car?" S answered [mama k'a:]*16	moocow	
	M asked S "What's that?" pointing at a picture	cookie	
	of galloping horses and S answered [çi:~*18 çi ja~*12	water	water
	pokopoko~*10]*19	food*17	food
		baby	baby
		chicken	fish
		Philip (brother's name)	airplane
		Margo (sister's name)	

*16 It means "Mama has my car." or "My car is in mama's hand."

*17 S used a Japanese word [mamma] for something to eat and to drink. He used "Food" for some things which covered [mamma], e.g. syrup on a pancake etc.

*18 One of variations of horsey-sounds.

*19 It means "Horseys here are galloping."

Table 3. Preparation for the Syntacticization Process in the Case of T.Y., a male Japanese.

S : subject M : mother F : father N : Nakazima

Age	Speech Development	Speech Sounds*1 []	Words, S began to utter	
			spontaneously	in imitation
Year Month				
0 : 7	<i>Development of phonatory-articulatory-auditory mechanisms during the period of babbling</i>			
0 : 8	S babbled repetitively.			
0 : 9	<i>Reorganization of babbling phonatory-articulatory-auditory mechanisms and their application to language</i>			
	S began to respond to his parents with simple sounds.			
0 : 10	S began to call to his family members with simple sounds.			
	S began to understand and to imitate his parents' speech sounds.			
0 : 11	S found a dog's picture in his book and uttered	[wanwan] (bowwow)*2	[wanwan] (bowwow)	[wanwan]
1 : 0			[çi:] (urine)	[çi:]
			[papa]	[ur:] (fire engine)
1 : 1	S tried to imitate F's [kofe] (this) and uttered	[dɔŋkietçɛ~*3 kofje*4]	[kofe] (this)	[papa] [kofe] [poi]
	S pointed at N's tape recorder and uttered	[kɔje]*4	[poi] (throw)	[tɕintɕin] (street car)

*1 Refer to their soundspectrograms in Fig. 2.

*2 One of variations of [wanwan]-sounds (bowwow).

*3 One of examples of sentence-long meaningless sound clusters in a conversational way.

*4 One of variations of [kofe]-sounds (this).

- When S was talking to F and M, he uttered
[o:ɔ:ideɬɕa:]^{*3}
- For these several months, S uttered, in all sorts of situations, meaningless sounds and [wanwan]-, [kɔfe]-sounds with various articulatory forms, and sometimes he uttered in a conversational way sentence-lang meaningless sound clusters and two- or three-words-sentence-like sounds mostly including [kɔfe]-sounds.
- 1 : 2 When S was playing alone with F nearby, S uttered [k'wə^{*4} tɕoɪ^{*5}] [bu:] [bu:]
(car)
- 1 : 3 *Development of phonemicization and symbolization of speech sounds* [ɬɕintɕin] [atta] [nenne]
(there was) (lying down or sleeping)
S was playing with his bricks. [mama] [mama]
S picked up one of them and said [ta:]^{*6} [mama] [mama]
F asked S [kɔfɛwə] (This?) pointing at a street [mamma] [mamma]
car's picture and S answered [tɛati:]^{*7} (food)
- 1 : 5 *Development of syntacticization of words* [ɕwɕɕw] [ɕwɕɕw]
(choo-choo)
F asked S "What's this?" pointing at a car's picture and S answered [ɣkə^{*4} bu:]^{*9} [hai] [hai]
(here it is) [pan]
Then F asked S again "Which one is a car?" [dʒu:sü] (bread)
S pointed at it and said [ə koejə^{*10}] [memme] (no)
[ja] [fɪʃisan]
(be) (maid's name)
[kwkkw] (shoe)
[aita] (ouch)
[itɕi]^{*11} (one)
[ɸutatsü]^{*11} (two)
- 1 : 6 F asked S [kɔfɛwə] (This?) pointing at a picture of a lion on the ground and S answered [pan] [dʒu:sü]
[nenne]
answered [nenne]^{*12} [fɪʃisan]
F asked S [kɔfɛwə] (This?) pointing at a dog's picture and S answered [küë^{*4} goe^{*4}] [ɬɕatɕa] [ɬɕatɕa]
wanwan]^{*13} (tea) [oiɕii] (sweet)
[mite] (look at me) [muɕi] (insect)

*5 One of examples of word-long meaningless sound clusters.

*6 One of variations of [atta]-sounds (there was).

*7 One of variations of [ɬɕintɕin]-sounds (street car).

*8 F and S seemed to construct a sentence [kɔfɛwə ɬɕintɕin] (This is a street car.).

*9 This is the first two-words-sentence, meaning "This is a car."

*10 [koe] is one of variations of [kɔfe]-sounds (this). [jə] is one of variations of [ja]-sounds (is). /ja/ is placed at the end of a sentence. Its function is similar to a copula in English. [koejə] means "This is."

*11 We do not think S knew their exact meaning at his age level.

*12 F and S seemed to construct a sentence [kɔfɛwə nenne] (This is lying down.).

*13 It means "This is a bowwow."

S found an airplane and uttered	[aε* ¹⁴ aε aε	[afe]	[itai]
	kō:ɸɸ ^{*15}]* ^{*16}	(that)	(painful)
	[kü:ɸ ^{*15} pɰ: ^{*17}]* ^{*18}	[çiko:ki]	[ɸɰ:ɸɰ:]
		(airplane)	(mouse or rat)
		[kiɸa]	
		(train)	
		[basüü]	
		(bus)	

*14 One of variations of [afe]-sounds (that).

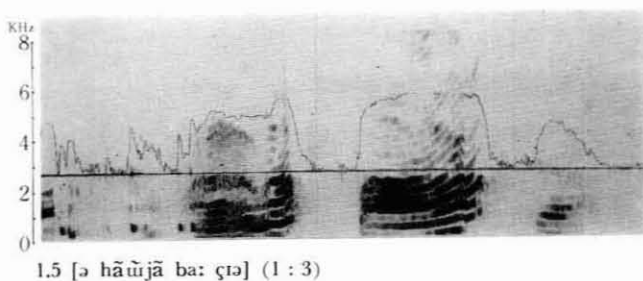
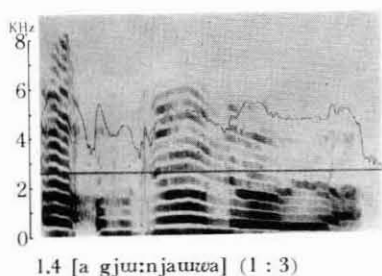
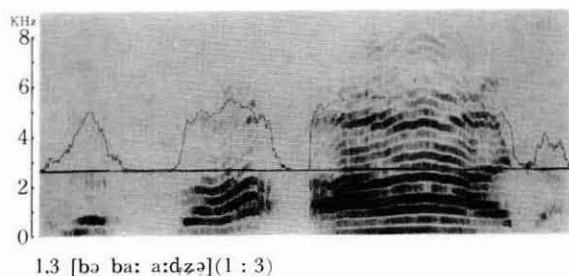
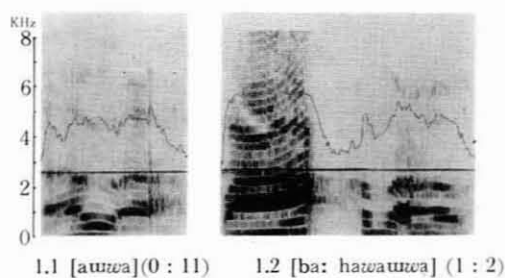
*15 One of variations of [çiko:ki]-sounds (airplane).

*16 It means "That is an airplane."

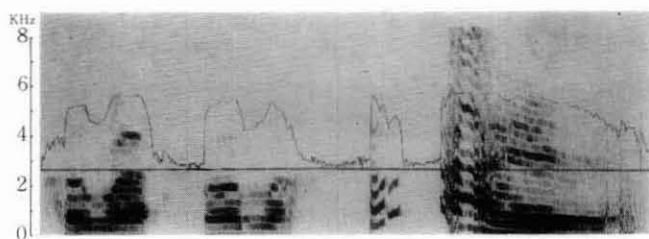
*17 One of onomatopoeias, made by S, showing roaring sounds of an airplane.

*18 It means "An airplane flies roaring."

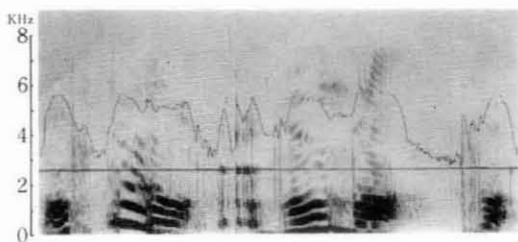
Fig. 1. Soundspectrograms of Speech Sounds of E.D., male American. Refer to Table 2.



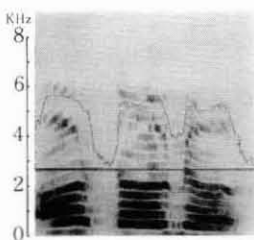
These sounds, shown on soundspectrograms, are not the same as those described by the phonetic alphabets, but only roughly similar to them, e.g. [a] means [a]-like sound etc.



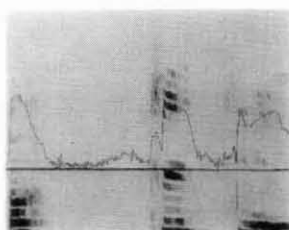
1.6 [hauwa wauwa ʔaʔ ʔa:ʕe] (1 : 3)



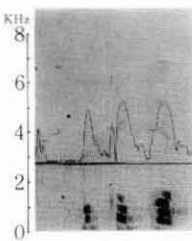
1.7 [ɛmpɔwa bumba pwa] (1 : 4)



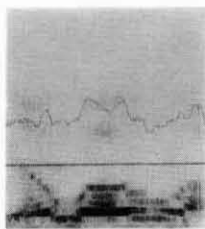
1.8 [a: njamjaɪ](1 : 4)



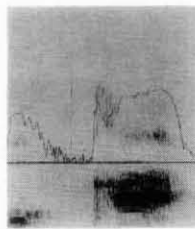
1.9 [ʔa tɔɪtɔɪ:] (1 : 8)



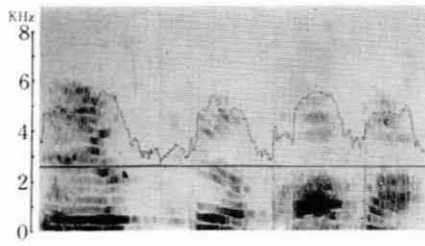
1.10 [pa pakapa]
(1 : 9)



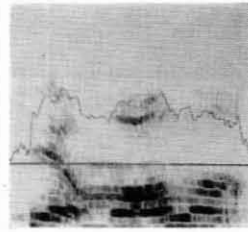
1.11 [ɕɪjaɪwaɪwa]
(1 : 9)



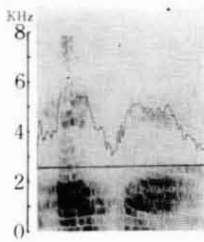
1.12 [ɕɪɔ k'a:]
(1 : 9)



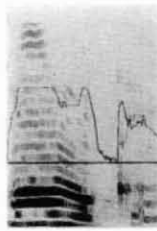
1.13 [çi: çi:ja p'apa] (1 : 9)



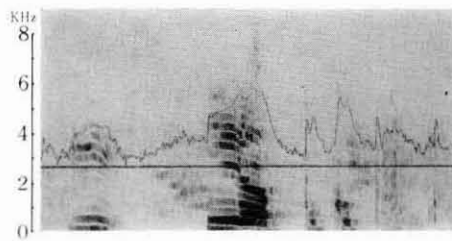
1.14 [çijəməma] (1 : 9)



1.15 [p'apa:] (1 : 9)

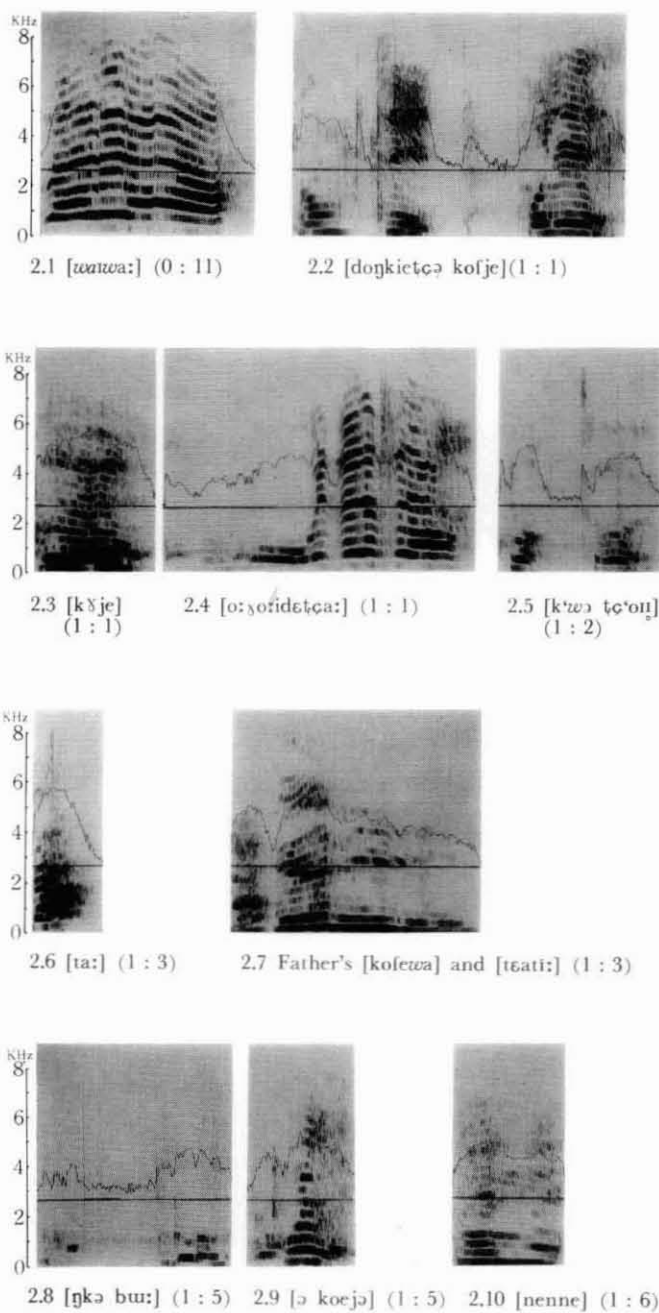


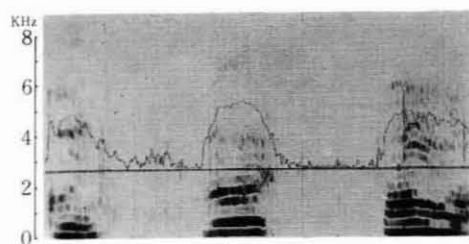
1.16 [mama k'a:]
(1 : 10)



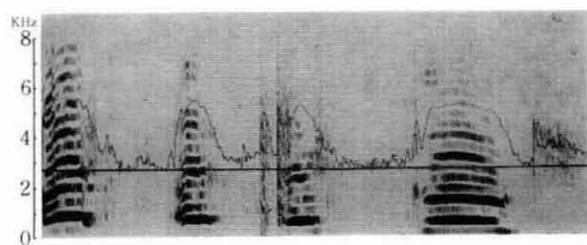
1.17 [çi: çi:ja pəkopəko] (1 : 10)

Fig. 2. Soundspectrograms of Speech Sounds of T.Y., male Japanese. Refer to Table 3.

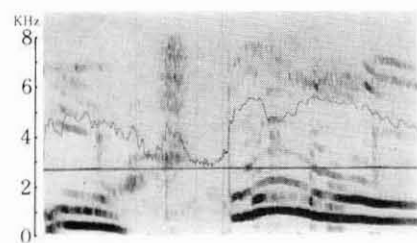




2.11 [kũrẽ goe wãntɔan] (1 : 6)



2.12 [aɛ aɛ aɛ kō:tɕɪ] (1 : 6)



2.13 [kũ:ɕɪ pu:] (1 : 6)